

NATIONAL WATERFOWL COUNTS

THE 1991 NATIONAL CENSUS OF PINK-FOOTED AND GREYLAG GEESE IN BRITAIN

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SUMMARY

The 32nd consecutive census of Pink-footed and Greylag Geese in Britain took place in autumn and early winter of 1991. Two discrete counts were undertaken, recording maxima of 232,962 Pink-footed Geese in October and 88,272 Greylag Geese in November. The Pink-footed Geese total, representing a large increase (22%) compared with 1990 due to increased coverage and coordination, is believed to be a close estimate of the true population. The large decrease (23%) in Greylag Geese gives cause for concern and although some birds were certainly missed by the census, this would probably only account for a small increase in the recorded total. Regional distribution of the birds and the importance of key sites is discussed. Breeding success was moderate in Pink-footed (18.1% young) and poor in Greylag (14.9%) Geese. Brood sizes were average with 2.10 and 2.29 birds for Pink-footed and Greylag Geese respectively. The discrepancy between the trends in two species' populations that, until the mid 1980s, were very similar, prompts further investigation into the causes of the difference.

INTRODUCTION AND METHODS

The 32nd consecutive national census of Pink-footed *Anser brachyrhynchus* and Greylag *A. anser* Geese in Britain was conducted in autumn and early winter of 1991. The methods used followed previous years with, as in 1990, two discrete counts being made. The majority of observations were conducted by volunteers, usually made as evening or dawn counts at known roost sites, although in some areas, where the locations of roost sites were poorly known, daytime counts of feeding birds were made.

Following the recommendations of Kirby (1990), two counts were conducted in autumn and early winter. The earlier date corresponded to the time of arrival of Pink-footed Geese from the breeding grounds, with the aim of obtaining more accurate counts for this species. The first count was

conducted on either 12/13 October (mainly central and east Scottish regions) or 19/20 October (most other regions). The second was centred on 9/10 November, although counts from later dates from some regions have also been included in the total (e.g. a coordinated count of the Inner Hebrides was conducted in late November).

Breeding success was assessed by recording the proportion of young birds and brood sizes in sample flocks. These assessments were made by a few experienced observers between late September and early December, largely in Dumfries & Galloway (Caerlaverock), Lancashire (Martin Mere), north Norfolk, east Grampian, Perth & Kinross, Central and around the Moray Basin.

WEATHER AND CONDITIONS

Counts made in October, on both the 12/13 and 19/20, were hampered at many sites by rain, misty conditions or thick fog throughout Great Britain, affecting a large proportion of sites in Highland, Grampian, Perth & Kinross, Lothians, Borders, Northumberland and the Solway, and were particularly bad in Fife. Some observers attempted counts on following dates and it is believed that, despite the conditions, a relatively good count was achieved. Unlike 1990, there were very few occasions where the presence of birds was noted due to calls being heard but a count could not be made.

There was a new moon on 7 October and a full moon on the 23rd. While this will have had little effect on counts conducted on the first weekend, the near full moon on the 19/20th may have resulted in birds remaining on feeding grounds late into the night in areas with clear skies which, consequently, would have been missed at roost counts.

The weather in November was much more conducive to good goose counting, with clear, although cold, conditions in many places. Rain and dull conditions affected counts at a few sites, generally on the Sunday of the count weekend, in Tayside, parts of Grampian, Fife and Northumberland, although this was not noted to have affected count accuracy.

There was a new moon on the 6 November. The numbers of geese recorded at roost sites on 9/10th are thus not thought to have been affected by nighttime feeding.

COVERAGE

A total of 194 sites was covered by the censuses, 160 in October and 177 in November, with the increased coverage in November being largely due to a survey of the Inner Hebrides. This represents a further increase on the good coverage in 1991, excepting the coverage of many sites in Dumfries & Galloway and Strathclyde in November 1990 which was found to be largely fruitless and thus was not repeated in 1991. Some of this increase is related to the classification of sites for recording purposes. However, several districts submit counts simply as area totals so that the true number of individual sites covered is greater still, reflecting the efforts of regional organisers.

RESULTS AND DISCUSSION

Total numbers

Pink-footed Geese

The count of 232,962 Pink-footed Geese in Britain in October 1991 (Table 1) was by far the largest produced by the census and reveals an increase in the numbers counted for the seventh consecutive year. The total for 1991 was 22% higher than the 191,452 birds recorded in November 1990*. Although counting conditions were poor in several regions in October, there were few suggestions that birds had been missed and, in view of the large number of sites covered and the large total, it seems likely that the number is close to the true population size.

The count in November produced 178,736 Pink-footed Geese, a reduction of approximately 23% on the October figure. The apparent loss of over fifty thousand birds in less than a month gives some cause for concern, especially in view of the much better counting conditions in November. However it has been suggested that a more accurate count of Pink-footed Geese could be obtained in October before birds start to disperse widely within Britain (Newton *et al.* 1990) and thus a reduction is perhaps to be expected.

Despite the 1990 total of Pink-footed Geese probably being an underestimate of around ten thousand birds (Kirby & Cranswick 1991), the increase in numbers in 1991 is far in excess of the steady rise of around six or seven percent observed in recent years (Figure 1). It is possible that the census produced an inflated total as a result of double-counting due to birds moving between sites counted on different weekends. The few comments received regarding feeding conditions suggested that stubbles had been ploughed quite early and this may have contributed to birds passing through quite quickly, as noted by some observers (e.g. F. Mawby, in litt.). However, of the total October count, just over 55,000 birds were counted on the second weekend, with many of these birds concentrated at a handful of sites, mainly Loch Leven, Montrose Basin, the Tay Estuary, Loch of Kinnordy and the Solway Estuary. These sites are likely to have also held high numbers on the weekend of the 12/13 October, e.g. fog prevented counts at Loch Leven and the Tay on the 12/13th, yet counts on the previous weekend recorded similar numbers to the 19/20th (M.V. Bell, in litt.). Geese in the region around these sites were not thought to have undergone any major redistribution between the two count weekends (M.V. Bell, in litt.) and thus, although some of the birds counted on 19/20 October may have been included in other site counts previously, the number of birds which were double-counted is, at most, only a small part of the total.

Greylag Geese

The count of 88,272 Greylag Geese in Britain in November 1991 (Table 1) was a decline of 23% compared with 1990. Greylag numbers were generally low across the whole of Britain, despite good counting conditions, with low numbers reported from many sites. This would suggest that there has indeed been a real reduction in the size of the population. Several observers also noted that Greylags had arrived later than usual, suggesting that birds may have remained in Iceland for longer than normal. However, the results of limited searching in 1990 suggest that only a very small component of the population is to be found in Iceland at this time, although no similar observations were made in 1991. Counts in some regions prior to the census dates indicated that birds may have been missed on 9/10th November, perhaps due to birds moving to unknown roost sites e.g. up to 3,800 are believed to have been missed in Central and Tayside (M.V. Bell, in litt.). However, such adjustments will only have a relatively small effect of the total count.

The Icelandic population of Greylag Geese winters almost exclusively in Scotland, Northumberland and northern Cumbria, with birds found south of a line from the Isle of Man to Teesside being considered feral (Owen *et al.* 1986). However, there are several populations of feral birds within the wintering range of the Icelandic population (Owen & Salmon 1988), including approximately 1,500 birds in Dumfries & Galloway, mainly centred around Lochinch, approximately 500 birds in Central and Tayside sites and around 300 birds in Edinburgh and West Lothian. As in previous years, the birds in Norfolk are also included in the census total and, although some Icelandic birds may make the journey south with the Pink-footed Geese, the fact that over 500 Greylags were recorded in October tends to suggest that the majority of these birds are of local, and therefore feral, origin. A native population of around 2,000 birds is present on the Uists with further birds on the Inner Hebrides (Mitchell 1991). Unlike 1990, these have been included in the census total although there is believed to be little interchange with the Icelandic birds. Thus, at least 4,000 birds should be subtracted from the November total to obtain the number of Icelandic Greylags in Britain. Even if the figure is adjusted to allow direct comparison with the 1990 total, the November total was less than 90,000 birds.

* An error in the compilation of the report for the 1990 census meant that the Perth & Kinross total in November was too large by 3,300. The national total was thus 191,452 birds.

Table 1. The numbers of Pink-footed and Greylag Geese recorded in Great Britain in October and November 1991. The number of sites counted is also given.

| DISTRICT/REGION | OCTOBER | | | NOVEMBER | | |
|------------------------------|------------|----------------|---------------|------------|----------------|---------------|
| | Sites | Pinkfeet | Greylag | Sites | Pinkfeet | Greylag |
| Shetland | 1 | 1 | 92 | 1 | 1 | 108 |
| Orkney | 7 | 16 | 4,042 | 7 | 0 | 2,780 |
| Western Isles | 2 | 14 | 1,156 | 2 | 7 | 1,176 |
| Caithness | 1 | 7 | 2,562 | 1 | 0 | 4,216 |
| Sutherland | 4 | 0 | 1,194 | 3 | 0 | 1,768 |
| Ross & Cromarty | 6 | 11 | 4,887 | 6 | 0 | 5,221 |
| Inverness/Naim | 2 | 0 | 329 | 2 | 300 | 7,410 |
| Badenoch & Strathspey | 1 | 0 | 1,280 | 0 | - | - |
| Moray | 3 | 26 | 1,610 | 3 | 0 | 4,790 |
| Banff & Buchan | 2 | 17,150 | 150 | 2 | 12,350 | 300 |
| Gordon/Aberdeen | 4 | 5,623 | 1,438 | 4 | 5,870 | 8,809 |
| Kincardine & Deeside | 1 | 240 | 970 | 1 | 60 | 10,500 |
| Angus/Dundee | 11 | 24,220 | 4,972 | 11 | 19,320 | 2,201 |
| Perth & Kinross | 29 | 82,633 | 3,881 | 32 | 37,610 | 14,900 |
| Central | 4 | 4,238 | 481 | 4 | 2,462 | 1,083 |
| Fife | 8 | 5,358 | 576 | 9 | 6,294 | 2,862 |
| Argyll & Bute | 8 | 1 | 1,039 | 19 | 5 | 6,157 |
| Glasgow area* | 3 | 0 | 200 | 5 | 0 | 807 |
| Clydesdale | 2 | 2,800 | 0 | 2 | 1,395 | 74 |
| Stewartry/Wigtown | 8 | 0 | 1,809 | 9 | 17 | 4,974 |
| Annan. & Eskdale/Nithsdale** | 9 | 7,403 | 57 | 8 | 4,978 | 647 |
| East/Midlothian | 6 | 22,094 | 7 | 5 | 8,286 | 43 |
| Edinburgh/West Lothian | 2 | 2,000 | 256 | 3 | 650 | 1,416 |
| Borders west*** | 8 | 15,214 | 1,325 | 7 | 11,020 | 2,412 |
| Tweeddale | 2 | 32,636 | 0 | 2 | 12,446 | 0 |
| Northumberland | 7 | 36 | 2,970 | 7 | 2 | 2,611 |
| Cumbria** | 3 | 10 | 1,130 | 5 | 98 | 651 |
| Lancashire and Merseyside | 1 | 9,070 | 0 | 1 | 38,520 | 0 |
| Humberside | 1 | 710 | 0 | 1 | 1,165 | 0 |
| Lincolnshire | 10 | 21 | 0 | 11 | 250 | 0 |
| Norfolk | 4 | 1,430 | 506 | 4 | 15,630 | 356 |
| TOTAL | 160 | 232,962 | 38,919 | 177 | 178,736 | 88,272 |

* includes Bearsden & Milngavie, Clydebank, Cumbernauld & Kilsyth, Cumnock & Doon Valley, Dumbarton, East Kilbride, Eastwood, Glasgow City, Hamilton, Inverclyde, Kilmarnock & Loudoun, Kyle & Carrick, Monklands, Motherwell, Renfrew and Strathkelvin.

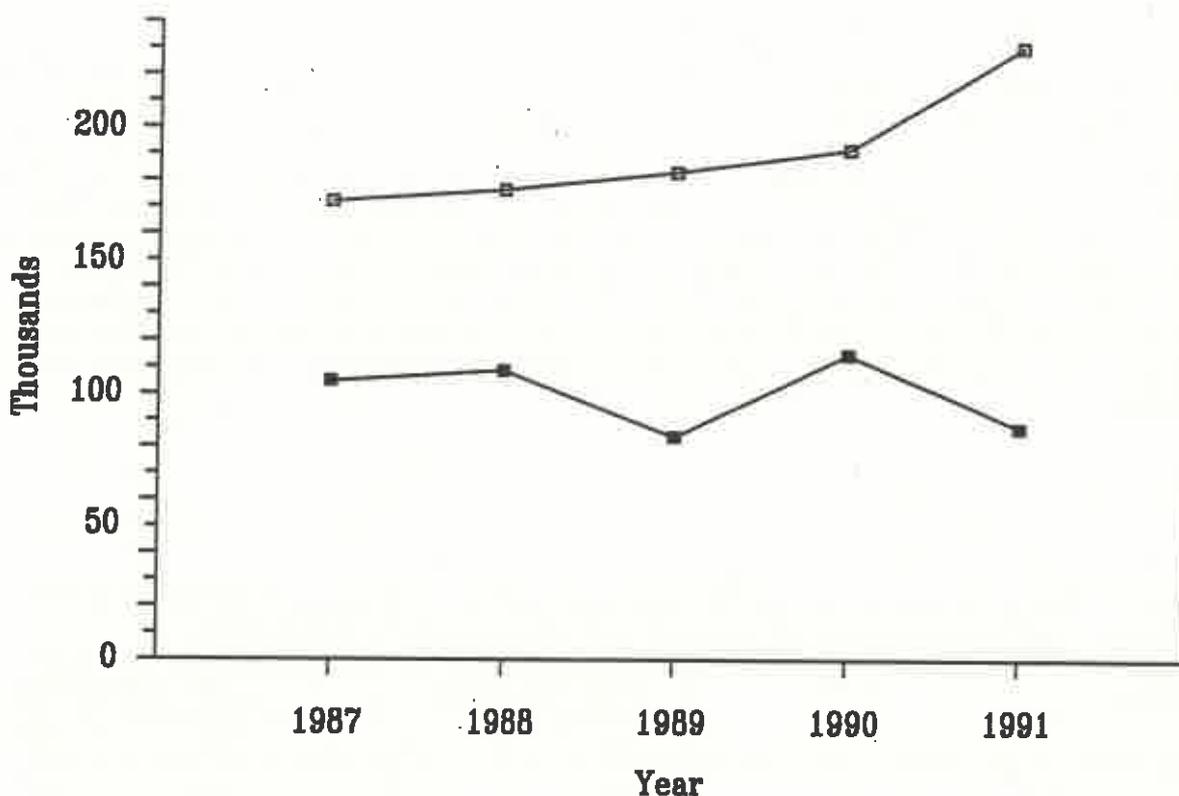
** for convenience, counts from the Solway Firth are included in the Annandale & Eskdale/Nithsdale total even though some birds roost and feed on the Cumbrian side of the estuary.

*** includes Ettrick & Lauderdale, Roxburgh and Berwickshire.

As was to be expected, the number of Greylag Geese counted in October was only a fraction of the November total, as many birds remain in Iceland at this time. The count of 38,919 birds was only 44% of that in November. Compared with 1990, when almost 70% of the November total was recorded in October, this perhaps lends weight to the suggestion that birds left Iceland late in the year.

Although the census recorded a similar decline in Greylag numbers between 1988 and 1989, it was followed by an increase to former levels the following year. It is thus too early to say whether the numbers point to a genuine decline in the Greylag population or simply a change in the timing of their migration. However, at least until the count in 1992, the results give cause for concern.

Figure 1. The numbers of Pink-footed (open symbols) and Greylag (closed symbols) Geese recorded by WWT censuses, 1987 to 1991.



Regional Distribution within Britain

The distribution of Pink-footed and Greylag Geese by region/district in October and November 1991 is shown in Table 1, whilst Table 2 shows the gross regional distribution of geese.

Pink-footed Geese

In October the vast majority of birds were in eastern Scotland, with over half of the total found in Fife, Central and Tayside, and over 100,000 in Tayside alone. Approaching one third of the total was in the Lothians and Borders and eastern Grampian accounted for a further 10%. Over 9,000 and 1,000 birds had reached Lancashire and Norfolk, respectively, by October. For many regions, the numbers of birds were similar to those in October 1990, with the notable exception of Tayside, which held twice the equivalent 1990 total. Although this increase will be partly due to improved coverage, the large increase in this area alone is somewhat anomalous. By November, there was a noticeable movement south, with increases in the numbers in Lancashire and Merseyside and Norfolk, with numbers in the former area being a record total. This corresponded with a marked decline in numbers in Tayside, Lothians and Borders, each region holding only a third to a half of the number recorded in October.

Greylag Geese

In October, prior to the main arrival, only North and East-central Scotland held significant numbers of birds, with the largest concentrations being in Orkney, Ross & Cromarty and Tayside. By November, around one quarter of the total was found in each of North, North-east and East-central Scotland, with the Moray Basin, eastern Grampian and Perth & Kinross being the notable strongholds. Perth & Kinross was one of the few regions in which a notable increase in the number of birds (3,630) over 1990 was recorded. By comparison, around 20,000 less birds were recorded in eastern Grampian than in 1990.

Principal sites

Pink-footed Geese

Pink-footed Geese were recorded at 89 sites in all, 67 in October and 64 in November (Figures 2a & 2b). The habit of this species to congregate in large numbers at roosts is illustrated in Table 3. Accepting the proviso that some counts are submitted as region totals and have been treated as single sites, nine sites held in excess of 10,000 birds on at least one of the two counts while 19 sites held over 3,000 birds (Table 3). Indeed, almost half (48%) of the total number of geese in October was to be found at just four sites, with the totals from only seven sites required to account for two-thirds (66%) of the total. By November, following the dispersal of birds from traditional arrival points and the movement of many birds south to England, numbers at the majority of the very large roosts had fallen considerably, although the number of medium sized roosts (in excess of 3,000 birds) remained constant. All counts of more than 5,000 birds, on either the October or November count, are given opposite:

Table 2. Gross regional distribution of Pink-footed and Greylag Geese in Britain in October and November 1991, expressed as a percentage of the maximum count for each species.

| AREA* | PINK-FOOTED GOOSE | | GREYLAG GOOSE | |
|--|-------------------|-------------|---------------|--------------|
| | Oct | Nov | Oct | Nov |
| North Scotland | <0.1 | 0.1 | 17.9 | 26.1 |
| North-east Scotland | 10.0 | 7.9 | 4.8 | 28.0 |
| East-central Scotland | 50.6 | 28.5 | 11.4 | 24.2 |
| South-east Scotland/North-east England | 30.1 | 13.4 | 3.9 | 6.0 |
| South-west Scotland/North-west England | 4.4 | 2.8 | 4.9 | 15.3 |
| West England | 3.9 | 16.7 | 0.0 | 0.0 |
| East England | 0.9 | 7.4 | 0.6 | 0.4 |
| Total | 100.0 | 77.0 | 43.5 | 100.0 |

* areas are defined as follows:

North Scotland: Shetland, Orkney, Western Isles, Highland.

North-east Scotland: Grampian.

East-central Scotland: Tayside, Central, Fife.

South-east Scotland/North-east England: Lothian, Borders, Northumberland.

South-west Scotland/North-west England: Strathclyde, Dumfries & Galloway, Cumbria.

West England: Lancashire, Merseyside.

East England: Humberside, Lincolnshire, Norfolk.

Dupplin Loch, Perth & Kinross: 38,900 (Oct), 10,690 (Nov); Lancashire and Merseyside: 38,520 (Nov), 9,070 (Oct); West Water Reservoir, Tweeddale: 32,636 (Oct), 12,446 (Nov); Loch Leven, Perth & Kinross: 21,880 (Oct), 9,770 (Nov); Loch of Strathbeg, Banff & Buchan: 17,150 (Oct), 12,350 (Nov); Montrose Basin, Angus: 15,000 (Oct), 8,320 (Nov); Hule Moss, Berwickshire: 12,000 (Oct), 8,840 (Nov); Snettisham, Norfolk: 11,560 (Nov); Fala Flow, Midlothian: 11,362 (Oct); Aberlady Bay, East Lothian: 7,982 (Oct), 7,690 (Nov); Carsebreck Lochs, Perth & Kinross: 7,770 (Oct); Loch of Kinnordy, Angus: 6,120 (Nov), 5,120 (Oct); Cameron Reservoir, Fife: 6,054 (Oct), 5,000 (Nov); Melkie Loch, Gordon: 5,850 (Nov), 5,620 (Oct).

In addition to the census counts, several goose groups and individuals make regular visits to roosts, especially shortly after the birds' arrival, and may record a large turnover of geese. Of particular note in autumn and winter 1991 was a count at Dupplin Lochs, a site already boasting one of the highest average peak of Pink-footed Geese in the country in recent years, which recorded at staggering 57,500 birds on 28 September, virtually 25% of the population. Several sites in Fife, the Lothians and Borders held large numbers away from the census count dates, indicating redistribution or a rapid turnover of birds e.g. Cameron Reservoir held 12,270 on 24 November, compared with only 6,054 on 10th; Fala Flow held over 10,000 birds on three dates in October, with one count of over 15,000 birds, yet less than 1,000 were recorded in November; Hule Moss held 17,207 birds on 20 October, compared with 12,000 on 13 October and just under 9,000 on 10 November.

Table 3. The number of sites* holding flocks of various sizes of Pink-footed or Greylag Geese during the census counts in 1991. "Either" gives the number of sites for which the peak count, regardless of month, exceeded the relevant number.

| NUMBER AT SITE | PINK-FOOTED GOOSE | | | GREYLAG GOOSE | | |
|----------------|-------------------|-----|--------|---------------|-----|--------|
| | Oct | Nov | Either | Oct | Nov | Either |
| ≥1,000 | 31 | 25 | 37 | 12 | 27 | 29 |
| ≥2,000 | 23 | 18 | 27 | 5 | 8 | 11 |
| ≥3,000 | 15 | 15 | 19 | 3 | 6 | 8 |
| ≥5,000 | 12 | 13 | 14 | - | 3 | 3 |
| ≥10,000 | 7 | 5 | 9 | - | 1 | 1 |
| ≥20,000 | 3 | 1 | 4 | - | - | - |
| ≥30,000 | 2 | 1 | 3 | - | - | - |

* some counts are submitted only as totals for a recording area and have been treated as single sites.

Greylag Goose

Greylag Geese were recorded at 144 sites in the two counts, 91 in October and 128 in November (Figures 3a & 3b). Greylag Geese tend to be more dispersed, favour smaller roost sites and generally gather in smaller numbers than Pink-footed Geese, shown by the large number of sites supporting small or moderate numbers of birds (in excess of 1,000). Conversely, there were few very large roosts, with three roosts holding over 5,000 and only one with over 10,000 birds (Table 3). All counts of more than 3,000 birds, on either the October or November count, are given below:

Dinnet Lochs, Kincardine & Deeside: 10,500 (Nov); Beaully Firth, Inverness: 7,000 (Nov); Loch of Skene, Gordon: 5,298 (Nov); Loch Eye, Ross & Cromarty: 4,659 (Oct), 3,928 (Nov); Caithness: 4,216 (Nov); Loch of Lintrathen, Angus: 3,950 (Oct); Lochinch, Wigtown: 3,300 (Nov); Orkney West Mainland: 3,099 (Oct).

Among other counts received, notable maxima away from the census dates included: 6,000+ birds at Haddo Country Park, Grampian, on 25 November, compared with 2,800 on 9 November; 6,600 at Loch Spynie on 26 October compared with a census maximum of 2,800 on 10 November; and a series of counts at Dinnet Lochs recording over 15,000 birds on four occasions with a maximum of 18,400 on 2 November, falling to 10,500 birds by 9 November.

Figure 2a. The location of Pink-footed Geese in October 1991 (not shown are birds in Orkney, Shetland, the Western Isles and Argyll & Bute).

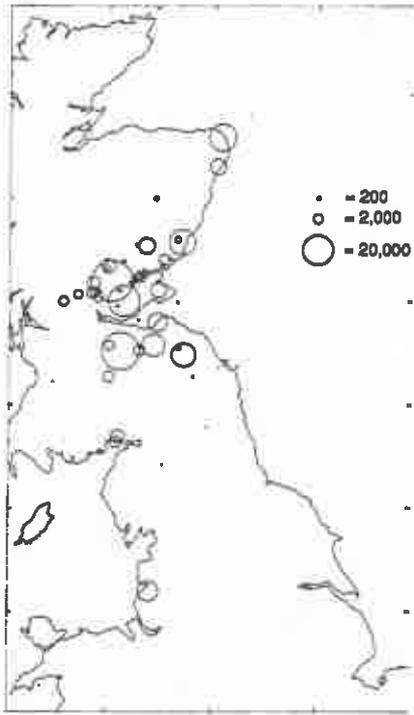


Figure 2b. The location of Greylag Geese in November 1991 (not shown are birds in the Western Isles, Shetland and Argyll & Bute).

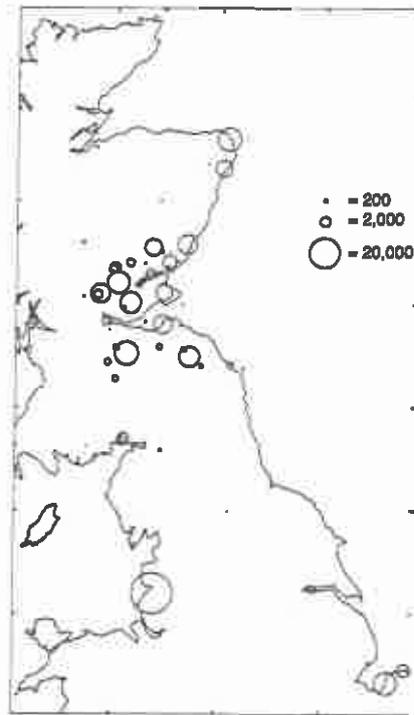


Figure 3a. The location of Greylag Geese in October 1991 (not shown are birds in Shetland and Norfolk).

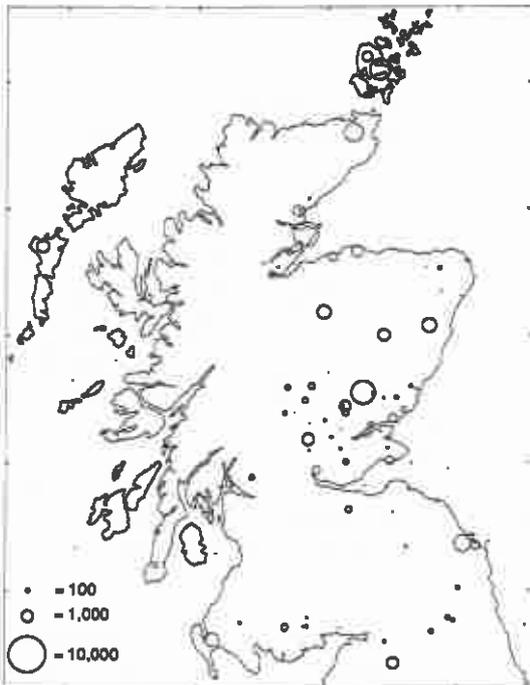
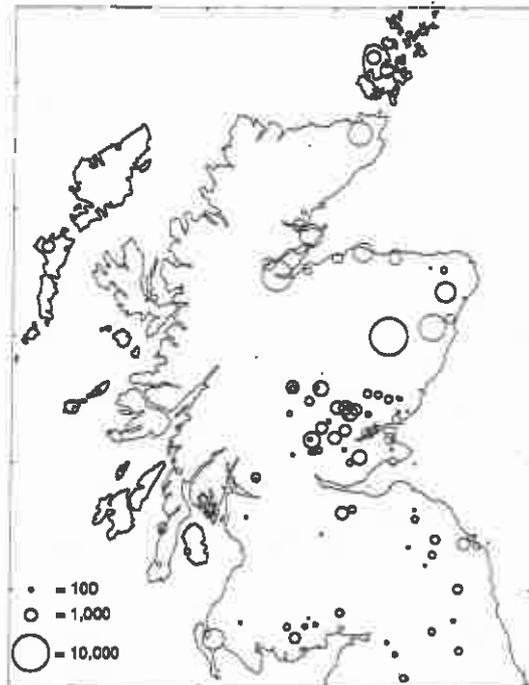


Figure 3b. The location of Greylag Geese in November 1991 (not shown are birds in Shetland and Norfolk).



Breeding Success

Pink-footed Geese

Breeding success was moderate in Pink-footed Geese with 18.1% young (Table 4) observed in sample flocks, slightly less than the average in recent years (Figure 4). Mean brood size was also slightly less than average, although the decline from 1990 was relatively smaller than that shown by the proportion of young. With the mortality rate calculated at around 10% (Fox *et al.* 1989), such a level of breeding success should only produce an increase in the population of around 6% from 1990. These figures thus suggest that the high October count of Pink-footed Geese is due largely to improved coverage and detection of birds.

Although a large number of birds were aged, over half of the birds aged and almost two-thirds of the brood sizes assessed were in just one region. These results could thus be subject to regional or observer bias and such factors need to be investigated further to ensure we are obtaining accurate assessments.

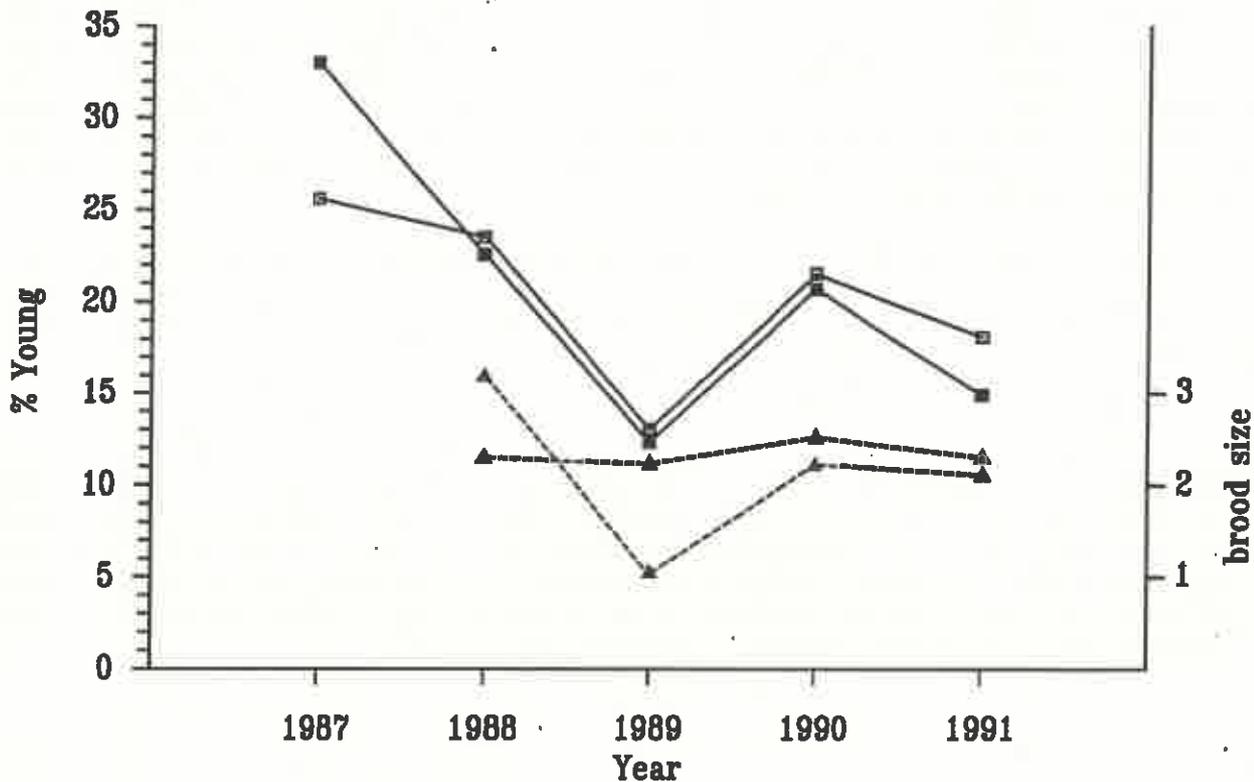
Greylag Geese

Breeding success in Greylags was poor in 1991, with only 14.9% young observed in sample flocks (Table 4) although mean brood size (2.29) was about average. However, despite the low proportion of young, an increase of 2-3% in the population would have been expected with the mortality rate estimated at around 10% (Fox *et al.* 1989). This suggests that the mortality rate for this species may have increased in recent years. Interestingly, brood size in Greylag Geese has remained fairly constant in recent years despite a fluctuating number of young (Figure 4).

Table 4. The proportion of young and average brood sizes in Pink-footed and Greylag Goose flocks in autumn and early winter of 1991. Regions are defined in Table 2.

| | Region | No. of flocks | Total aged | % young | no. of broods | Brood size |
|--------------------------|-----------------------|---------------|------------|---------------|---------------|------------|
| Pink-footed Goose | North Scotland | 2 | 1,000 | 18.2 | 30 | 2.33 |
| | North-east Scotland | 5 | 1,595 | 24.4 | 19 | 2.05 |
| | East-central Scotland | 11 | 6,428 | 16.2 | 232 | 2.07 |
| | South-west Scotland | 9 | 569 | 17.9 | 42 | 2.31 |
| | West England | 6 | 1,504 | 21.9 | 32 | 1.91 |
| | East England | 4 | 1,114 | 15.7 | 0 | - |
| | Total | | 37 | 12,210 | 18.1 | 355 |
| Greylag Goose | North Scotland | 1 | 400 | 12.3 | 7 | 2.71 |
| | North-east Scotland | 3 | 2,100 | 14.1 | 78 | 2.17 |
| | East-central Scotland | 6 | 1,970 | 16.2 | 58 | 2.41 |
| | Total | | 10 | 4,470 | 14.9 | 141 |

Figure 4. The percentage young (squares) and brood size (triangles) for Pink-footed (open symbols) and Greylag (closed symbols) Geese, recorded by WWT censuses, 1987 to 1991. Brood size is not available for 1987.



CONCLUSIONS

Unlike 1990, conducting an October count in addition to the traditional November date to provide better population estimate for Pink-footed Geese seems to have borne fruit in 1991. Not only, as predicted by Newton *et al.* (1990), was the higher count of Pink-footed Geese achieved in October, but the census probably also counted the highest proportion of the population in recent years, although this will have resulted from improved coverage as well as the timing of the count. That birds are more concentrated and thus easier to count early in the season is illustrated by the fact that a high proportion of the birds were located at just a handful of sites.

The success of the counts is due in no small part to the efforts of local goose groups and their organisers. With the rapid turnover of Pink-footed Geese at arrival sites, it is imperative that counts in any one region are well coordinated to ensure that double-counting does not occur. Also, some of the groups and some individuals conduct a series of counts at roosts. This information is invaluable in providing a background to the two census counts. Roost usage is dependent on many local factors and it is well known that geese may remain on feeding grounds over night if conditions are favourable, e.g. bright moonlight allowing the birds to continue feeding, or even unfavourable, e.g. adverse weather conditions may prevent birds from flying to the roost. Disturbance at or around the date of the count may also affect the number of birds using the roost. A one-off count at the time of the census cannot determine whether the count is low due to the probability of missing birds. The coordination at a local level means that a low count at one roost can be compared with adjacent roosts. Whether the "missing" birds from the site have been picked up at other roosts in the region or whether the local total should be adjusted for these anomalies can only be judged by a local coordinator with a thorough knowledge of the area. Comments to this effect from local organisers play an important part in producing an accurate total for this report. Thus, although it may seem that

the October count is now on a sound footing and that the Pink-footed Goose population can be censused with greater accuracy than previously, there is still, perhaps, room for improvement and where possible, coordination of all counts at a regional level must be a priority for the future. Series of counts at the time of the census, at least at the more important sites, will also play a part in improving our understanding of the species. Such counts would also highlight the importance of sites which retain moderate to large numbers of birds throughout the season, which may, under the current method of listing site importance according to the average of the annual peak, appear of much less significance than those sites which, for perhaps only one day, hold extremely large numbers of geese as they migrate south through Britain.

The number of Greylag Geese recorded by the census gives cause for concern. Although the similar decline recorded in 1988 was followed by a return to previous levels, it is impossible to say whether or not this will be repeated in 1992. Although some birds may have been missed and some remained in Iceland, these numbers are likely to be small. With their preference for smaller roost sites, it is possible that a significant proportion of the birds is being overlooked, especially, as suggested by some observers, in areas with difficult access. We need to reassess our censusing of this species to ensure adequate coverage of the population. The low census total is thus worrying, either in terms of a real decline in the population, or of inadequacies in the census techniques nationally or, probably, both.

The majority of goose mortality in Britain is a direct result of man's activity, largely shooting, with mortality due to other factors calculated at less than one percent (Fox *et al.* 1989). First estimates from the first annual report of a WWT/British Association for Shooting and Conservation (BASC) project to investigate shooting kills of Pink-footed and Greylag Geese, suggest that between 15,000 and 26,000 Pink-footed Geese and 12,000 and 16,000 Greylag Geese are shot annually, based on returns from a questionnaire to BASC members and published literature. Further work will investigate the extent of shooting outwith BASC membership. Of particular concern recently is the attention attracted by touring parties from the continent, notably Italy, both for their shooting prowess and also the large number of game shot, particularly geese in Tayside and Central. Certainly, the marked difference in the population growth of the two species, which until the mid-1980s had been very similar, deserves more intensive study. The WWT/BASC contract aims to assess the number of birds shot, although, ideally, an independent measure of mortality is needed, most readily obtained from an individual marking programme (Bell *et al.* in press).

Despite the continuing increase in the number of Pink-footed Geese, the species remains vulnerable to disturbance and exploitation due to the concentration of such a high proportion of the population at a few key sites. Conservation measures at these sites must ensure that, where shooting occurs, it is conducted in accordance with a sensible and sustainable regime, such as that suggested by BASC, and that other disturbance factors are kept to an acceptable level. The effect of such factors on the distribution of geese was the focus of a study in the Lothians and Borders commissioned by the then Nature Conservancy Council for Scotland (Cranswick in prep.). Although there is little or no literature on the loss of sites, it has been suggested that Pink-footed Goose roosts are very slow to recover after excessive disturbance has caused the roost to be abandoned. The importance of several goose roosts on an international level is recognized by their designation as Special Protection Areas under the EC Wild Birds Directive, or as Ramsar sites under the Ramsar Convention on Wetlands of International Importance and this status should be used in safeguarding these sites. However, with the increase in the population, measures must also be taken to accommodate geese within Britain's agricultural landscape and so, where possible, prevent conflict between the birds and farmers. The need for safe havens for geese where disturbance is minimal will be instrumental in encouraging the birds to remain in an area where measures can then be taken to accommodate the birds. These were some of the issues considered at a workshop on goose damage and management (Owen & Pienkowski 1991), convened by WWT, attended by many parties with an interest in geese.

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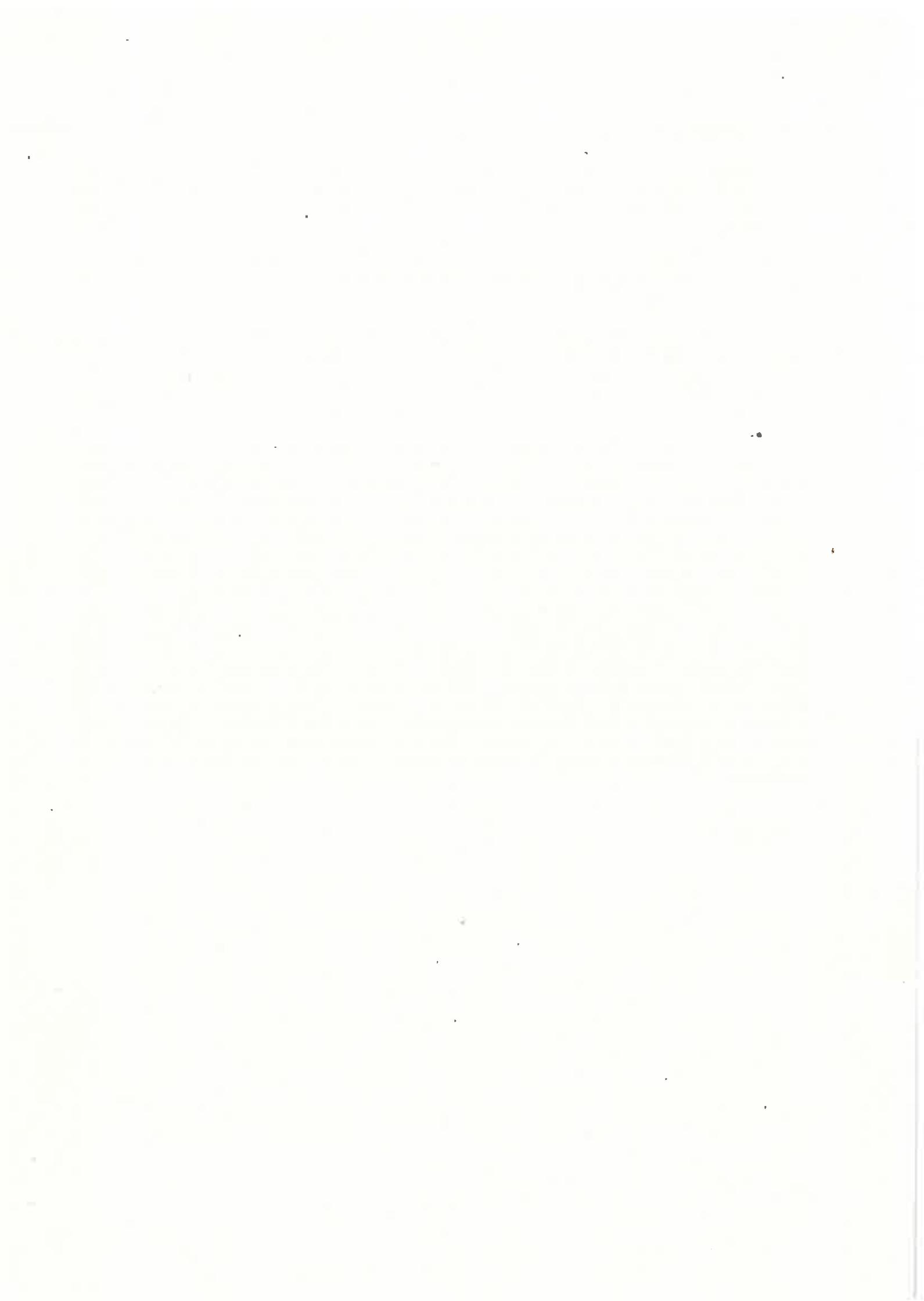
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